



Geomorphometric mapping of spatio-temporal changes in Plio-Quaternary uplift in the NW European Alpine foreland

Alain Demoulin (1,2) and Hadrien Bourdon (1)

(1) Université de Liege, Dept of Physical Geography and Quaternary, Liege, Belgium (ademoulin@ulg.ac.be), (2) FRS-FNRS, Brussels, Belgium

A way to explore the causes of Plio-Quaternary uplift in NW Europe consists in identifying the distribution of uplifted areas and evaluating relative uplift ages. Here we use the composite metric R of fluvial landscapes, which involves three different hypsometric integrals (catchment, drainage network, and trunk stream), in order to get time information (Demoulin, 2011). Main controls on R are catchment size A and uplift age. To isolate the latter information, we use the derived SR index, which is the slope of the linear fit between R and $\ln(A)$. We calculate R for more than 7000 basins larger than 15 km² and determine SR values for 60-km-wide regions in five N- to NW-trending zones of alternating Paleozoic massifs (Massif central-Brittany; Rhenish shield; Bohemian massif) and Meso-Cenozoic basins (Paris basin; Franconian basin) covering the whole NW European platform in front of the alpine arc. The resulting 350- to 750-km-long SR profiles seem to provide the most meaningful time information, better than that obtained with noisier higher-resolution SR maps. Preliminary results of the study especially evidence a systematic increase in SR from south to north across the Paris basin and Rhenish shield zones that suggests northward propagation of an uplift wave that started from ~ 200 km north of the alpine collision front in Pliocene times and travelled across this part of the European platform. The Bohemian Massif and the Massif central-Brittany zone show more complex SR patterns that might be linked to interferences between the uplift wave and more local phenomena (related, e.g., to WNW-oriented compression in front of the Carpathian arc). Surprisingly, the Franconian basin displays fairly uniform low to moderate SR values suggesting that no tectonic perturbation occurred there since at least the late Early Pleistocene. In conclusion, this new geomorphometric approach of uplift chronology provides a wealth of data, whose careful analysis will help get fresh insight into the timing and the causes of Plio-Quaternary uplift in NW Europe.

- Demoulin A., 2011. Basin and river profile morphometry: A new index with a high potential for relative dating of tectonic uplift. *Geomorphology* 126, 97-107.